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10/510,005	08/12/2005	Ulrich Katscher	PHIDE020083US	9846
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FUJITA, KATRINA R				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/510,005

Applicant(s)

KATSCHER ET AL.

Examiner

KATRINA FUJITA

Art Unit

2624

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 December 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-946)
- 3) ☐ Information Disclosure Statement(s) (PTO/SE/US)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. This Office Action is responsive to remarks received on December 19, 2007.
Claims 2-9 and newly added 10-14 remain pending.

Drawings

2. The previous drawing objections have been withdrawn in light of Applicant's amendments.

Specification

3. The previous specification objections have been withdrawn in light of Applicant's amendment.

Claim Suggestions

4. The previous claim suggestion has been withdrawn in light of Applicant's amendment.

Claim Objections

5. The following is a quotation of 37 CFR 1.75(a):

The specification must conclude with a claim particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention or discovery.

6. Claim 9 is objected to under 37 CFR 1.75(a), as failing to particularly point out and distinctly claim the subject matter which application regards as his invention or discovery.

Claim 9 lacks antecedent basis for "the second data set" in line 16. The following will be assumed for examination purposes: -- the second image data set --.

Claim Rejections - 35 USC § 112

7. Claim 7 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The specification describes a computer program that causes a

computer to execute the invention on page 5, yet there is no explicit description of computer hardware containing the computer program. As such, the "tangible computer readable medium" is not supported by the specification.

Claim Rejections - 35 USC § 101

8. The previous 101 rejection has been withdrawn in light of Applicant's amendment.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claims 9, 13 and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by Vollmar et al. ("Iterative Reconstruction of Emission...", IEEE Article, which includes a specific method found in Schmidlin et al., "Iterative reconstruction of PET images", Phys. Med. Biol.).

Regarding **claim 9**, Vollmar et al. discloses a method for selectively imaging body structures ("computer simulations and a PET study of a cat" at section III, line 11), the method comprising steps of:

using a first tomography method to acquire a first image data set ("PET study" in figure 3),

using a second tomography method to acquire a second image data set, the second tomography method having a higher resolution than the first tomography method ("MR study" in figure 3) and the second image data set containing image data that at least partly coincides in space with image data of the first image data set ("Registration" in figure 3),

reconstructing an image from the first image data set ("images with improved resolution" in figure 3), and

wherein data from the first image set used in the reconstruction set is selected using the second image data set; ("A-priori-information" in figure 3),

wherein the reconstruction step further comprises the steps of:

selecting a region to be imaged from at least one region represented in the second image data set ("same anatomical region" in figure 2 caption), and

calculating the image reconstruction from image data in a region represented in the first image data set that corresponds to the selected region represented in the second data set ("Cologne HOSP" in figure 3).

Regarding **claim 13**, Vollmar et al. discloses a device wherein the selecting means includes:

an automatic segmenting means ("Segmentation Thresholds" in figure 3) which segments a second image reconstructed from the second image data set (an image resulting from "any reconstruction method" in figure 3), the selected portion of the first image data corresponding to the segmented region of the second image ("same anatomical region" in figure 2 caption; "appropriate anatomical regions" in figure 3).

Regarding **claim 14**, Vollmar et al. discloses a device further including:

registration means for registering the first image data set and the second image data set ("Registration" in figure 3).

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 6 and 8 rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Vollmar et al. and common knowledge in the art as evidenced by Delaney et al. ("Multiresolution Tomographic Reconstruction Using Wavelets", IEEE Article).

Regarding **claim 6**, Vollmar et al. discloses a device for selective imaging of body structures ("computer simulations and a PET study of a cat" at section III, line 11), which device includes

first tomographic image data acquisition means for the acquisition of a first image data set ("PET study" in figure 3),

second tomographic image data acquisition means for the acquisition of a second image data set, which second tomographic image data acquisition means have a resolution which is higher than that of the first tomographic image data acquisition means ("MR study" in figure 3),

backprojection means for image reconstruction ("Cologne HOSP" in figure 3) of an image from the first image data set ("Corrected Sinograms" in figure 3), and

selection means for selecting, by means of the second image data set, the first image data ("same anatomical region" in figure 2 caption; "appropriate anatomical regions" in figure 3) to be reconstructed into a first tomographic image (the resulting "images with improved resolution" in figure 3), wherein the first image data set is situated in a selected image region ("A-priori-information" in figure 3) such that the backprojection means co-operate with the selection means in such a manner that the first tomographic image is calculated exclusively from the first image data set which are situated in the selected image region (the HOSP reconstruction calculates image information only based on the A-priori information from the MR study).

Vollmar et al. does not disclose selecting a portion of the first image data set and that the first tomographic image is calculated exclusively from the portion of the first image data set.

However, it is well known in the art to segment the area of reconstruction to an area of interest ("small area of interest is reconstructed at high (full) resolution" Delaney et al. at page 799, left column, paragraph 2, line 10).

Therefore it would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the region localizing of Delaney et al. to segment the PET data of Vollmar et al. using the segmented MR data of Vollmar et al. as the area of interest to allow significant reduction of computation time in the overall reconstruction (see Delaney et al. at page 799, left column, paragraph 2, line 9).

Regarding **claim 8**, Vollmar et al. discloses a method for selectively imaging body structures, comprising the steps of:

using a first tomography method to acquire a first image data set from a first spatial region ("PET study" in figure 3),

using a second tomography method to acquire a second image data set, the second tomography method having a higher resolution than the first tomography method ("MR study" in figure 3) and the second image data set containing image data that at least partly coincides in space with image data of the first image data set ("Registration" in figure 3); and

reconstructing the second image data set into a second image (an image resulting from "any reconstruction method" in figure 3);

segmenting the second image to define a selected image region ("Segmentation" in figure 3; figure 1, right image);

reconstructing an image from the first image data set ("images with improved resolution" in figure 3).

Vollmar et al. does not disclose segmenting the first image data set in accordance with the selected image region segmented from the second image to define a segmented first image data set.

However, it is well known in the art to segment the area of reconstruction to an area of interest ("small area of interest is reconstructed at high (full) resolution" Delaney et al. at page 799, left column, paragraph 2, line 10).

Therefore it would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the region localizing of Delaney et al. to segment the PET data of Vollmar et al. using the segmented MR data of Vollmar et al. as the area of interest to allow significant reduction of computation time in the overall reconstruction (see Delaney et al. at page 799, left column, paragraph 2, line 9).

13. Claims 2-5, 7, and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination Vollmar et al., Townsend et al. (US 6,490,476) and common knowledge in the art as evidenced by Delaney et al.

Regarding **claims 7 and 10**, Vollmar et al. discloses a method of selecting imaging body structures and a tangible computer readable medium which includes programming for making a computer carry out the method when the computer program

is executed on a computer ("computer simulations and a PET study of a cat" at section III, line 11), comprising:

acquiring a first image data set from a first spatial region with a tomographic nuclear medical imaging technique ("PET study" in figure 3);

acquiring a second image data set from a second spatial region with a second tomographic imaging technique ("MR study" in figure 3), the first and second spatial regions coinciding at least partially in space ("Registration" in figure 3);

reconstructing the second image data set into a second image (an image resulting from "any reconstruction method" in figure 3);

segmenting the second image to define a segmented second image ("Segmentation" in figure 3; figure 1, right image);

reconstructing the first image data set ("Cologne HOSP" in figure 3) into a first image ("images with improved resolution" in figure 3).

Vollmar et al. does not disclose forward projecting the segmented second image to form a segmented second image data set.

Townsend et al. teaches a method in the same field of endeavor of multimodal tomography imaging ("co-registered CT and PET images to be acquired sequentially" at col. 1, line 21) comprising forward projecting the segmented second image ("forward projection through the segmented and scaled CT images" at col. 17, line 32) to form a segmented second image data set (the forward projection produces attenuation correction factors which are applied to the rest of the segmented CT images for comparison to the PET images; see col. 17, lines 23-50).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the forward projection of Townsend et al. on the segmented image of Vollmar et al. to allow the images to be corrected accordingly for attenuation such that reconstruction can be more accurate (see Townsend et al. at col. 17, lines 18-19 and 42-50).

The Vollmar et al. and Townsend et al. combination does not disclose associating the segmented second image data with the first image data set to form a segmented first image data set.

However, it is well known in the art to segment the area of reconstruction to an area of interest ("small area of interest is reconstructed at high (full) resolution" Delaney et al. at page 799, left column, paragraph 2, line 10).

Therefore it would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the region localizing of Delaney et al. to segment the PET data of the Vollmar et al. and Townsend et al. combination using the segmented MR data of the Vollmar et al. and Townsend et al. combination as the area of interest to allow significant reduction of computation time in the overall reconstruction (see Delaney et al. at page 799, left column, paragraph 2, line 9).

Regarding **claim 2**, Vollmar et al. discloses a method wherein the nuclear medical technique includes SPECT or PET.

Regarding **claim 3**, Vollmar et al. discloses a method wherein the segmenting step is performed by an automatic segmentation routine ("Segmentation Thresholds" in figure 3).

Regarding **claim 4**, the Vollmar et al., Townsend et al. and common knowledge combination discloses a method wherein reconstructing the segmented first image data set is carried out by way of iterative backprojection ("iteration substeps are non-simultaneous (single projection)" Vollmar et al. at section 1-B).

Regarding **claim 5**, the Vollmar et al., Townsend et al. and common knowledge combination discloses a method wherein the iterative backprojection includes:

numerically forming an iteration image data set from the calculated image (" $x_i(n,p)$ ", Schmidlin et al. at section 2.1, paragraph 4, line 3),

determining a difference between the first image data set and the iteration image data set ("correction is applied directly to the image", Schmidlin et al. at section 2.1, paragraph 4, line 2),

adding the difference to the segmented first image image (" $x_i(n,p')$ ", Schmidlin et al. at section 2.1, paragraph 4, line 4), and

iteratively repeating the above steps until at least one convergence criterion is satisfied ("converge to zero", Schmidlin et al. at section 2.4, line 13).

Regarding **claim 11**, the Vollmar et al., Townsend et al. and common knowledge combination discloses a method wherein the convergence criteria includes the difference dropping below a predetermined convergence value ("converge to zero", Schmidlin et al. at section 2.4, line 13).

Regarding **claim 12**, Vollmar et al. discloses a method further including:
reconstructing the first image data set into a first image ("reconstruction of emission tomography data" at page 1560, section C, line 2);
registering the at least one of: the first and second images and the first and second image data sets ("Registration" in figure 3).

Conclusion

14. Applicant's arguments with respect to claims 2-8 have been considered but are moot in view of the new ground(s) of rejection.

15. Applicant's arguments filed December 19, 2007 have been fully considered but they are not persuasive.

Summary of Remarks (@ response page labeled 9): "There is no suggestion of forward projecting a segmented PET image in Vollmar."

Examiner's Response: This argument is moot in view of the new grounds of rejection necessitated by Applicant's amendment.

Summary of Remarks (@ response page labeled 9): Vollmar does not disclose associating the segmented second image data set with the first image data set to form a segmented first image data set.

Examiner's Response: This argument is moot in view of the new grounds of rejection necessitated by Applicant's amendment.

Summary of Remarks (@ response page labeled 10): The A-priori information indicates "appropriate anatomical regions" as described in the above rejections as seen in figure 3, which is what is built upon for the reconstruction of the PET data.

Conclusion

16. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to KATRINA FUJITA whose telephone number is (571)270-1574. The examiner can normally be reached on M-Th 8-5:30pm, F 8-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vikkram Bali can be reached on (571) 272-7415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Katrina Fujita/
Examiner, Art Unit 2624

/Vikkram Bali/
Supervisory Patent Examiner, Art Unit 2624